Status of FE-B Flex2 Module Testing

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Tools for Flex2 Module Testing:

- Mini-support Card
- Jumper Cable

Status of IZM FE-B + Flex 2 Module

- Progress so far

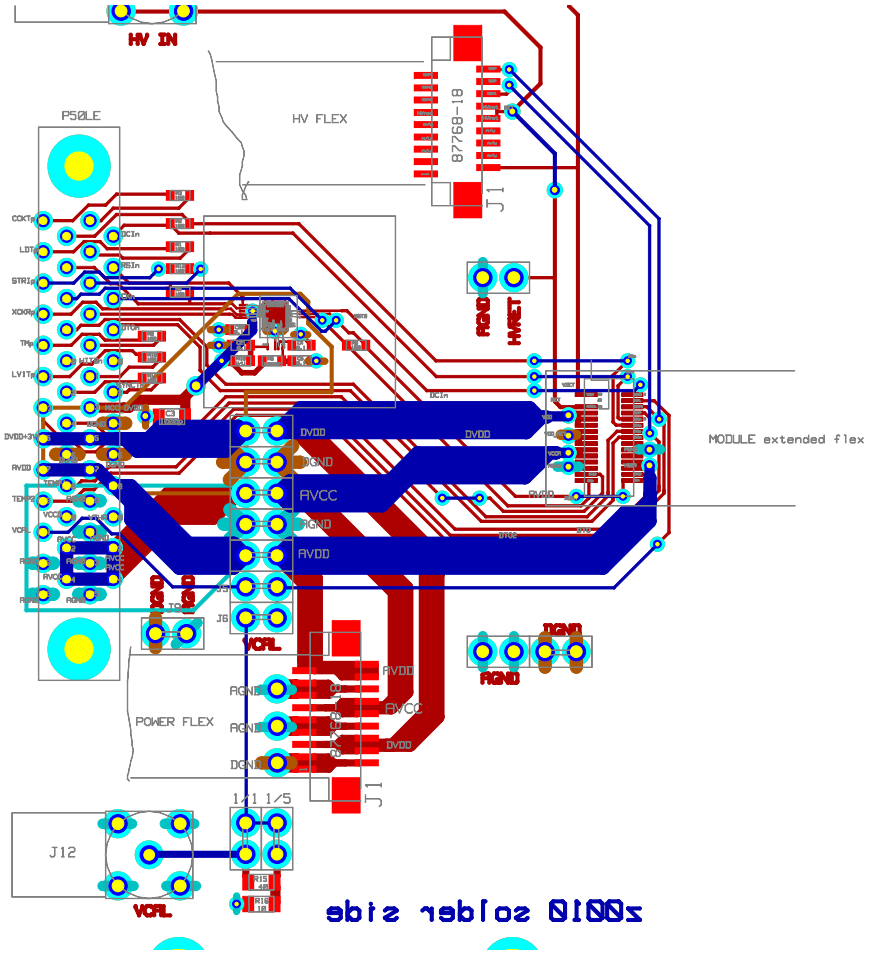
Steps towards a first realistic system test:

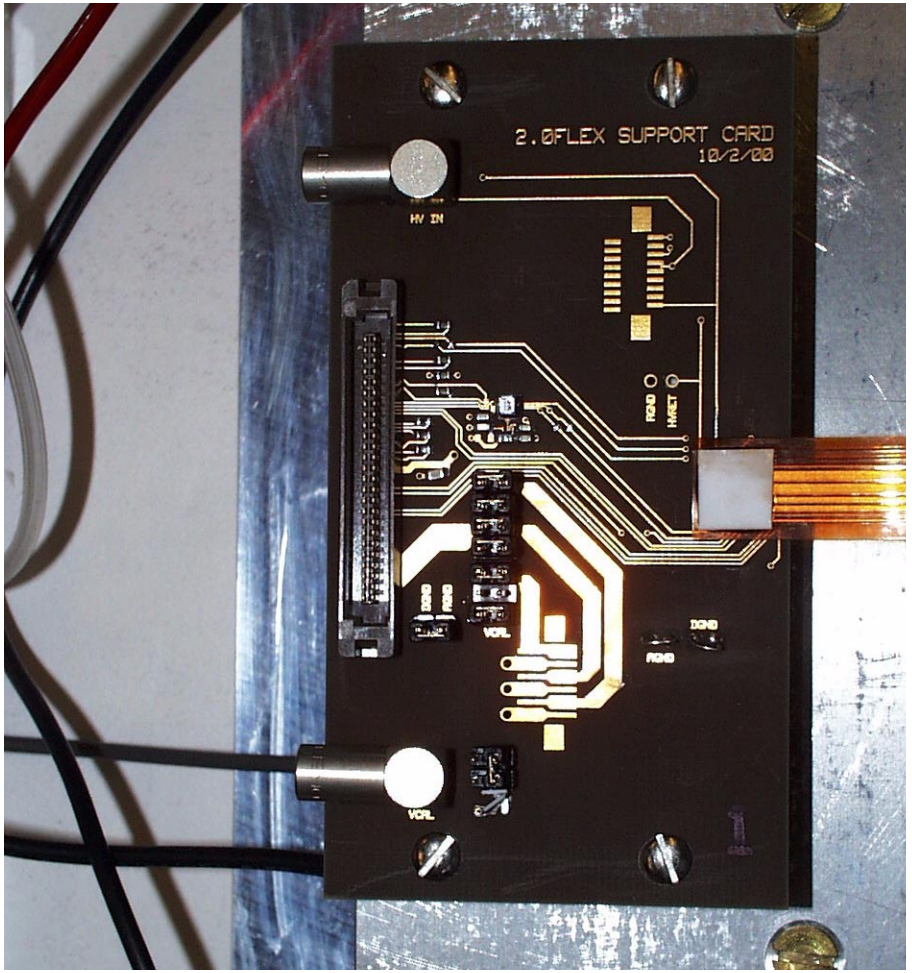
- Assembly of multi-modules onto sector for PLL testing
- Plans for ROD testing of multi-module sector

Tools for Flex2 Module Testing

Mini-support Card:

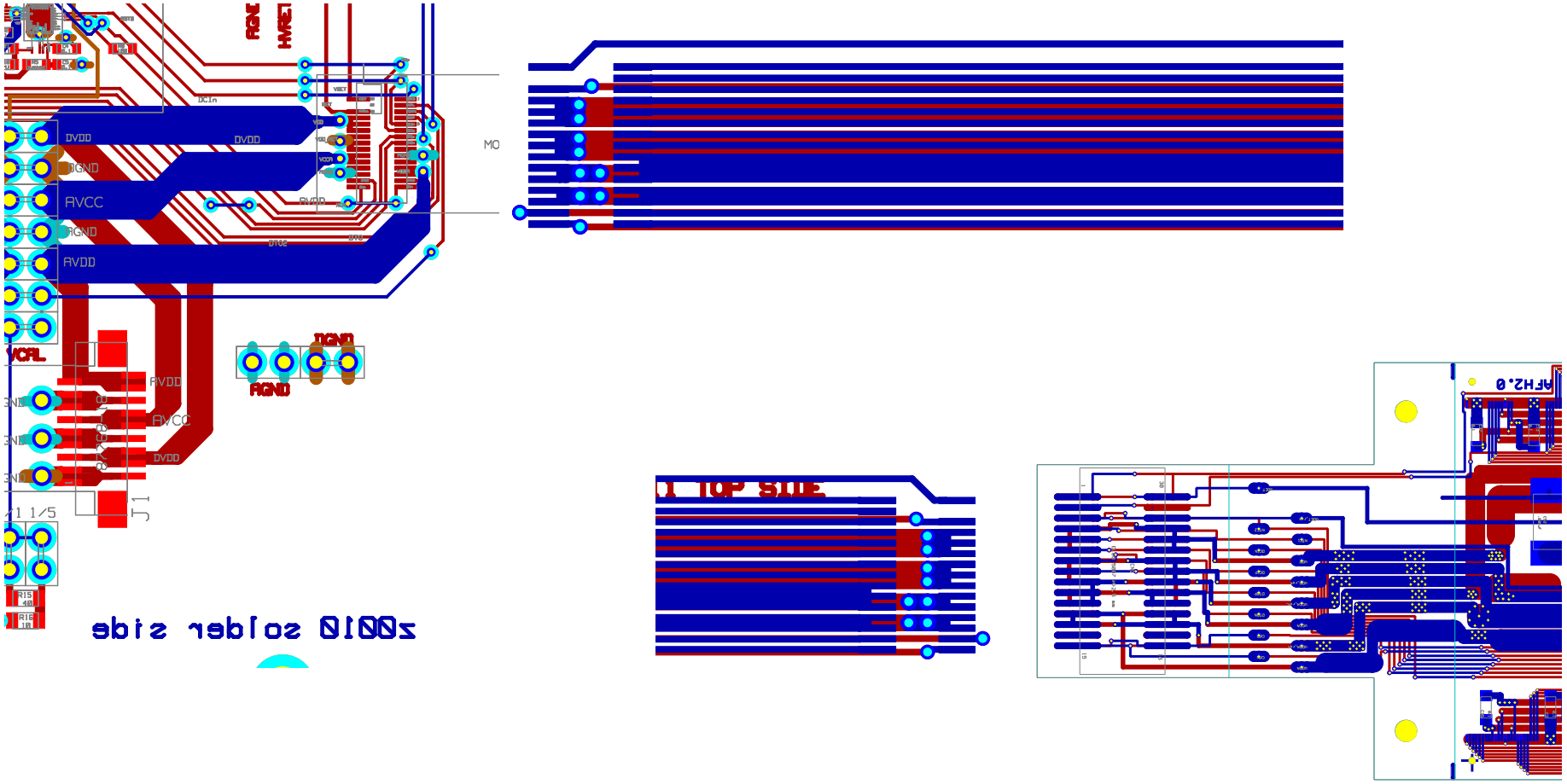
- Smaller version of single chip support card. Contains rad-hard LVDS buffer, pads and jumpers to allow mounting Berg connectors for attaching prototype power cables, plus usual support card features (HV connection and VCal connection via LEMO, VTH/VCCD jumpers...)





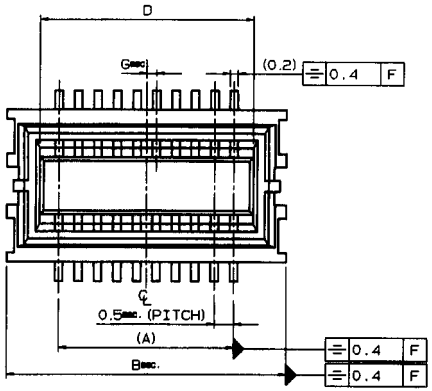
Jumper Cable:

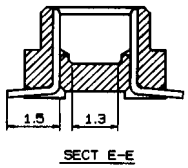
- Flex cable acting as short pigtail prototype (15cm length). Double sided for power and signal connections, fabricated from 1oz (35µ) Cu for lower voltage drops.
- Supports connection between 30-pin Elco 5087 mounted on Flex 2 test connector and similar connector on Mini-Support Card.



Mounting Conventions proposed:

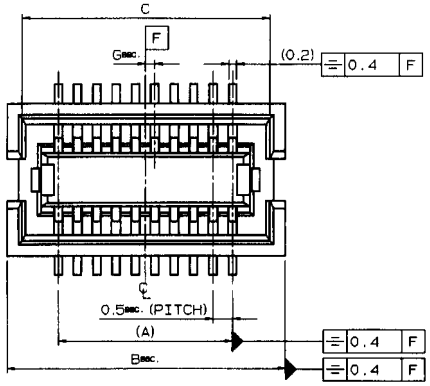
- Mount Elco5087 Receptacle on Flex 2, Mount Elco5087 Plug on Mini-Support Card. Mount appropriate matching connectors on Jumper cable.
- HV connection on Jumper is evident (trace is well-separated from others, and next to “Top Side” text on cable) and defines obvious orientation.
- To ensure decent HV performance, should remove connector pin which is adjacent to (but on the same side as) the HV bias pin.
- When mounted on Flex, need stiffener (e.g. ceramic) to distribute removal forces.
- Elco5087 connector genders:

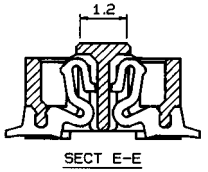




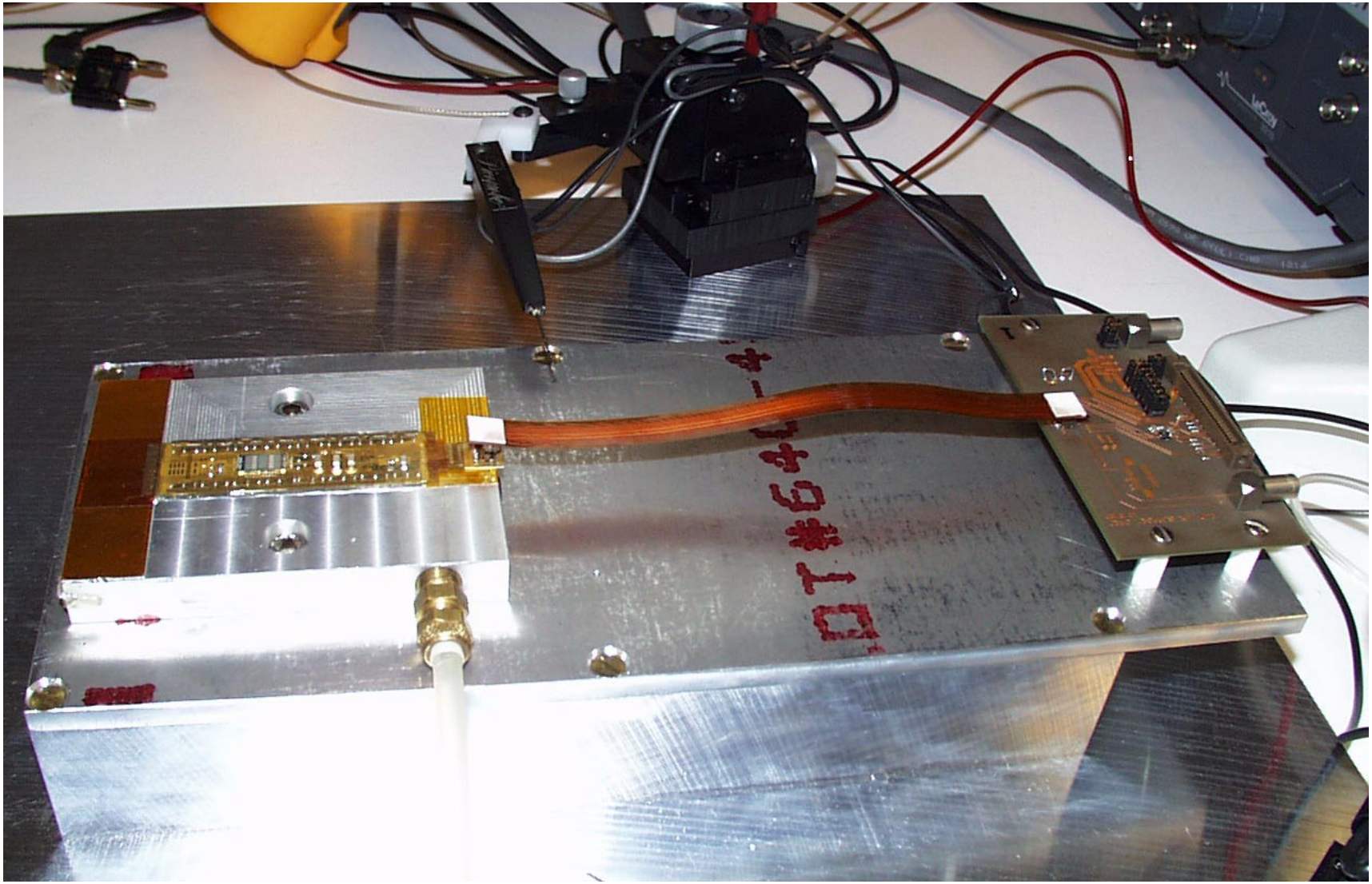
Plug

Receptacle





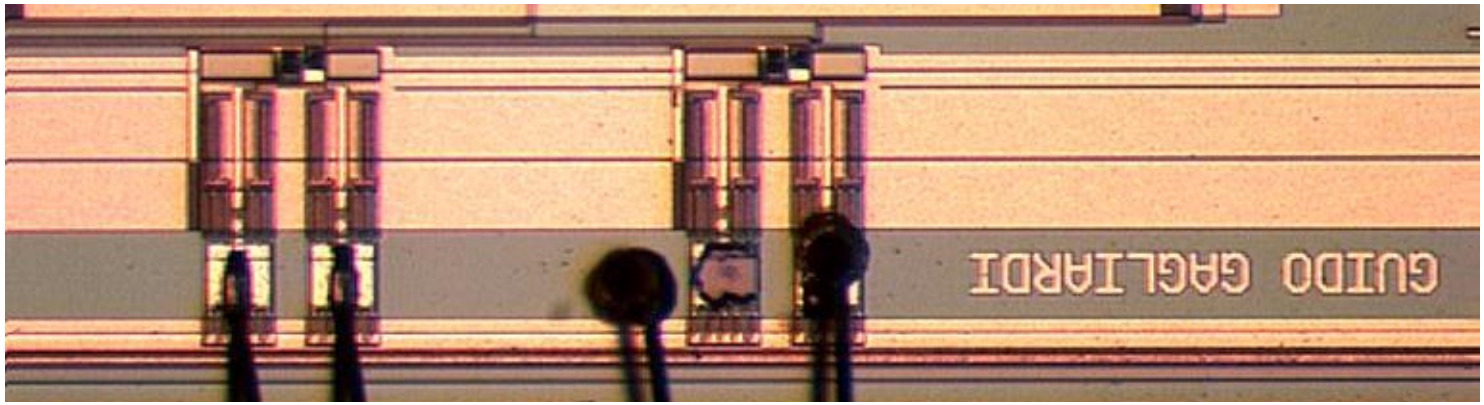
Complete setup mounted on support plate:



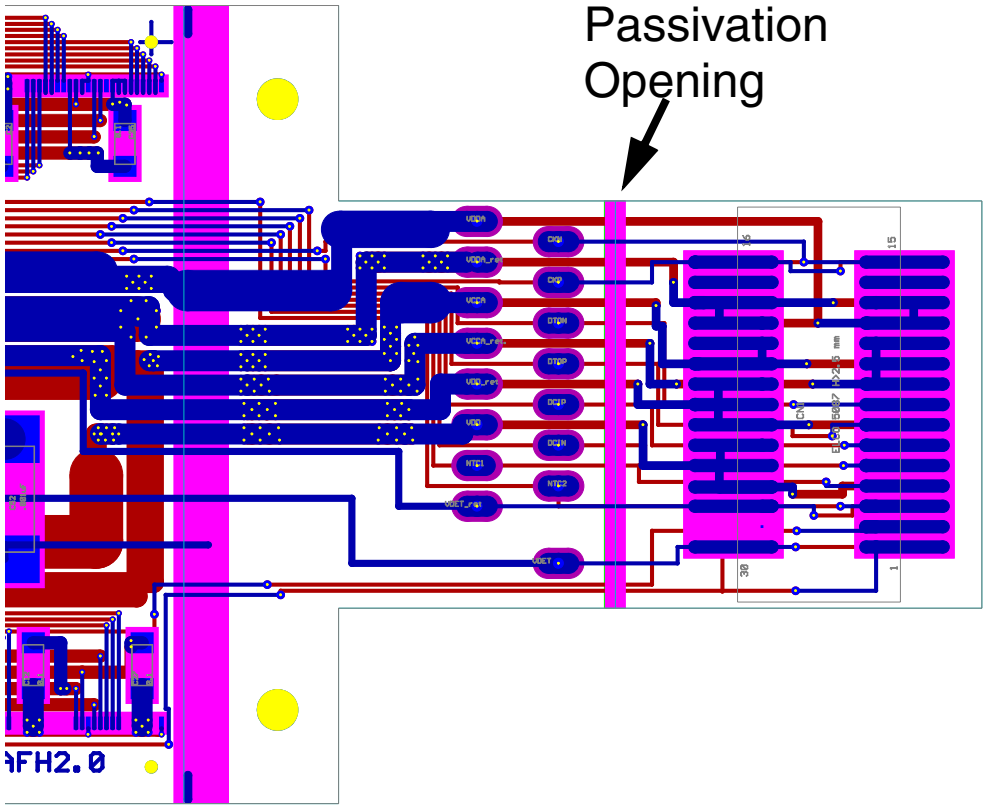
- Module mounted on vacuum chuck, containing 4 small holes per FE chip. Also used for probing of bare module prior to attachment of Flex.

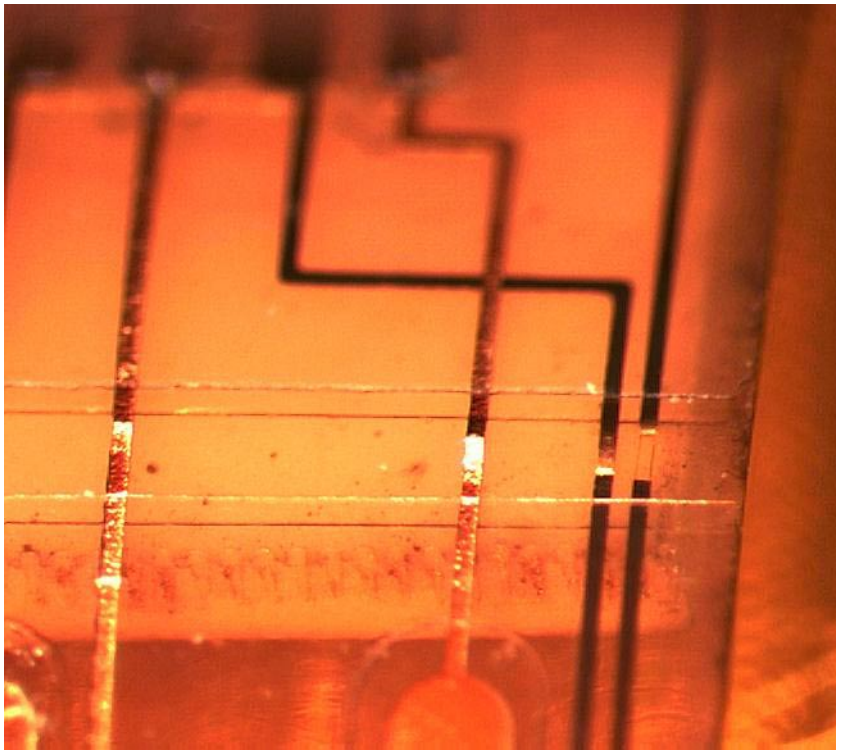
Status of IZM FE-B Module assembled with Flex2:

- Bare module tested by John Richardson in early October. Significant difficulty in contacting probe pads on FE chips with probe card (Be versus W needles ?) Suggests pad contamination problems, despite hand cleaning procedure of IZM.
- Good Compunetics Flex2 assembled with correct parts, and O2 plasma cleaned.
- Attachment made using prototype module assembly tooling and Thermagon Tpcm-905 film adhesive (125μ thickness). This is a phase-change adhesive and can be re-worked if heated above 50C. This is preferred for untested Flex.
- Wire bonding proceeded relatively well, but there were a modest number of adhesion problems on Flex and on FE chips. Used combination of semi-automatic Al wedge bonder and manual gold ball bonder to make all bonds.
- One trace lifted off the Flex due to poor trace adhesion, but bond stayed connected. Clear evidence for over-etching of Flex (very rounded trace corners).
- One MCC pad which pulled off from the die:



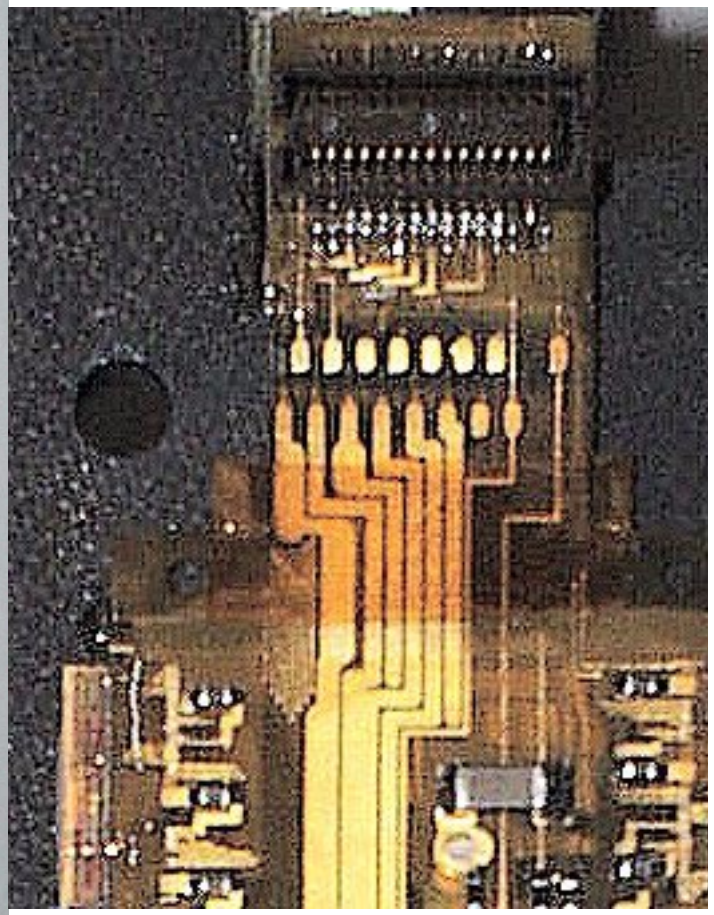
- Module was tested while still on vacuum chuck used for wire-bonding, using Mini-Support/Jumper system shown earlier. Clearly significant problems, even with power distribution.
- Visual inspection indicated that almost all traces in cut region between disk pigtail solder pads and test connector solder pads were broken. This part was handled by many people during assembly and it is not possible to be sure when the damage occurred. Inspection of cut, but not loaded, Flex showed signs of micro-cracks in some traces in this region also.





- Three cut regions on Flex2. Two have top-side openings in the coverlay only, because all traces have been routed to the Flex2 top side. The third, for removing the test connector, has coverlay openings on both sides since there are traces on both sides.
- The 25μ Kapton substrate, without coverlay protection, makes the Flex incredibly fragile (it is not really a Flex at all, since it does not use annealed Copper...). Very special handling is required (see talk of Maurice).
- Further believe that the coverlay openings are not necessary, even for the test connector. Careful routing of traces to insure no superposition of traces on opposite sides would allow cutting without danger of shorts from trace fragments.
- For now, the module has been mounted on a prototype sector using our usual CGL7018 and NEA123 glue protocol. The ceramic stiffener under the Elco connector has also been tacked to the Carbon-Carbon using NEA123. This completely immobilizes the Flex in the region of the broken traces, and will permit hand repair, by connecting small wires from Elco solder pads to pigtail solder pads. Traces on Flex passing through the other cut regions seem to be intact.

Module mounted on sector prototype:



Next Step: More Complete System Tests

First: Fully test first module after completing Flex2 repair work.

Second: Complete sector assembly using one AMS module that we have in LBL already, and one additional FE-B IZM module that hope to get soon (?) from Bonn.

Critical need for these system tests as we continue to finalize Flex and services design, module attachment. Many details will change with final electronics, but design choices can have significant effects on electrical performance of multiple modules.

Should also be pursuing parallel stave system test effort.

Initial readout will be awkward, requiring the use of several PLL's. Plan to investigate minor modifications to PixelDAQ to support operation of multiple PLL (one at a time).

Third: develop simple BOC-replacement for ROD, to allow connection of several modules via copper cables (instead of opto-links). This would also provide critical user feedback to evolving ROD design, which should occur on timescale of Summer 2001.

Additional issue: how many modules to build with MCC-AMS and how many with MCC-D2 ? Would like to switch to MCC-D2 as soon as possible, but presently Genova does not have capability to deliver tested bare die for Flex mounting. Strongly urge development of die probe capability for MCC test system (not difficult). Have investigated required changes in existing PLL firmware, and they are not too difficult, but preferred solution is to work with new TurboPLL system in early Spring.